

## **Instrument**

The invention relates to an instrument comprising a shaft with an actuating part at a distal end, and a handle with a control device for operating the actuating part at the proximal end. The handle is executed as an elongated grip with a slightly convex shape on the side intended for location against the palm of the hand. The control device is located on the side near the connection of the handle with the shaft.

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De invention relates to an instrument comprising a shaft with an actuating part at a distal end, and a handle with a control device for operating the actuating part at the proximal end.

Such an instrument is for instance described in the Dutch patent application nr. 1004056 of applicant, which is considered inserted here by reference. Such an instrument is applied in surgery and in particular in the area of minimally invasive surgery, more specifically laparoscopy.

Aforesaid instrument is provided with a scissor handle which functions as an operating device for the operation of a gripper or gripper jaws located at the distal end of the shaft of the instrument as actuating part. Such a scissor handle involves a number of problems. First, the scissor handle is not easy to operate in all positions of the instrument. Often, the surgeon must tie himself in strange knots in order to perform surgery with the described instrument. The whole body, as well as arm, wrist and hand must thereby be aligned with the desired position of the instrument. An undesirable physical stress occurs in particular when such a position must be maintained for a long time. A second disadvantage is that the ring shaped openings of the scissor handle, which serve as receivers for thumb or fingers, cause pinching of blood vessels en nerves in these fingers or thumb when inserted in the openings; this has a detrimental effect on the sensitivity during operation of the instrument. A third disadvantage is that the transfer of tactile information by the instrument equipped with such scissor handle, is difficult.

The goal of the invention is to overcome these problems and to achieve additional advantages that will be explained in more detail in the following.

The instrument according to the invention is characterized by the handle being executed like an elongated handle with a slightly convex curvature on the side intended for location against the hand palm, and by the control device being located on this side near the connection of the handle with the shaft. Because of this, the handle has a shape fitted to the form of the hand palm and lacks the openings for thumb or fingers which are replaced by the control device. The control device that is located on the side intended for location in the hand palm can be operated in this position, depending on the precise location, with thumb or index finger. Furthermore, the elongated grip of the handle makes the instrument suitable for operation from all sides, and it can be handled and operated with both the left and the right hand.

In a first preferred execution form, the handle is positioned in essence perpendicular to the shaft. In a second preferred execution form the handle is positioned in essence in line with the shaft. Both execution forms are suitable for the intended application in surgical instruments, whereby the just mentioned second execution form has the advantage of allowing handling of the instrument in three main positions, in particular a first main position whereby the control device is operated with the thumb, a second operational position whereby it is operated with the index finger, and a third position whereby it is operated with the thumb or index finger in the so-called "pen grip" of the instrument.

The flexibility of use of the instrument according to the invention is further increased by allowing the handle to rotate between the position in line with the shaft and

the position at least perpendicular to the shaft. It is thereby desirable that the handle can be blocked relative to the shaft.

It is preferred that the control device has, at least partially, an in essence cylindrically shaped actuating surface, and is connected to the instrument in such way as to allow its rotation. This gives the instrument a natural way of operation.

It is desirable that the actuating surface has a profile that corresponds with a profile on the actuating part. The release on the operating side of tactile information about the actuating distal end of the instrument is greatly enhanced by it.

In the described instrument, the actuating part is executed like a grip jaw. It is obvious that the control device that opens and closes it, is connected in such way with the grip jaw that for closing the grip jaw, the control device must be rotated in the direction of the shaft. However, for optimum ease of operation it is desirable according to the invention that the control device for actively opening and closing of the grip jaw is connected in such way that for closing the grip jaw the control device is rotated in the direction of the handle, and that for opening the grip jaw the control device is rotated in the direction of the shaft.

The invention will now be clarified by means of the drawing, in which Fig. 1 shows a detail of the instrument with a handle according to a first execution form of the invention; Fig. 2 shows a detail of an instrument with a handle according to a second execution form of the invention; Fig. 3 shows schematically an execution form of the instrument according to the invention with rotating handle relative to the shaft of the instrument; Fig. 4 a and 4b shows an execution form of the instrument according to the invention with a preferred connection between the control device and the actuating part; and Fig 5a, 5b, and 5c show possible different handgrips of the instrument according to the invention.

In the figures, the same reference numbers refer to the same parts.

Figures 1 and 2 show a first and second preferred execution form of the instrument according to the invention. The instrument comprises a not shown actuating part which is located at the distal end of a shaft 1. A handle 6 equipped with control device 5 used for operating the not shown actuating part, is located at the proximal end, as shown in fig. 1 and 2. The handle 6 is executed like an elongated grip 6 which is slightly convex curved on the side intended for location against the hand palm, indicated by an arrow. The control device 5 is also provided on this side of handle 6, whereby the latter is positioned near the connection of the handle with shaft 1. The execution forms shown here relate to the connection of handle 6 to shaft 1 of an instrument described in the Dutch patent application nr. 1004056 which is included here by reference. In order to create the connection of the control device 5 with the actuating part, the control device 5 is connected by means of a mounting part 4 with a roller 3 of a bearing roller which is connected with a corresponding bearing roller of the actuating part at the distal end of shaft 1.

Fig. 1 shows a first execution form whereby the handgrip 6 of the handle is positioned in essence perpendicular to shaft 1.

Fig. 2 shows the second execution form whereby handle 6 is positioned in essence in line with the shaft.

Fig. 3 demonstrates a sequence of positions of handle 6 relative to shaft 1 in counterclockwise moving direction. The position of the handle varies thereby from a position in line with shaft 1 to a position where the handle is moved past a perpendicular angle relative to the shaft. In order to enable this movement, the handle is installed rotating on shaft 1. Relative to the two degrees of freedom is valid that handle 6 can be blocked relative to shaft 1 in order to avoid undesirable changes in position. Fig. 1 and 2 show clearly that the control device 5 has, at least partially, an in essence cylindrically formed actuating surface and on the other hand is connected in such way with the instrument as to allow its rotation. The actuating surface of control device 5 has a profile which corresponds with the profile of the actuating part.

Fig. 4a shows positioned over each other the distal part of shaft 1 with an open grip jaw 7 and shaft 1 with the handgrip at the proximal end 6 in a position of the control device 5 that corresponds with the position of grip jaw 7. In this figure 4a is visible that the grip jaw is provided with an internal profile. A similar in tactile observation corresponding profile is by preference also made on the actuating surface of the control device 5 to promote the feedback of tactile information. In fig. 4a and 4b is respectively shown how a movement of control device 5 in the direction away from shaft 1 and toward handgrip 6, leads from an open position shown in fig. 4a to the closing of grip jaw 7 as shown in fig. 4b.

Fig. 5a, 5b, and 5c show possible handgrips of the instrument according to the invention. Fig. 5a shows the application of a handle positioned in essence in line with the shaft. Fig. 5b and 5c show handgrips related to an execution form whereby handle 6 is positioned in essence perpendicularly relative to shaft 1. The possible handgrips are not limited to the handle shown here; these handgrips are also possible with a handle positioned in line with the shaft.

For good handling and optimum use of the instrument according to the invention it is desirable that the grip 6 of the handle has a length in the range of 125-150 mm and a width at the central axis of the shaft of approximately 30 mm. The control device 5 must have a width of minimum 10 mm and maximum 20 mm.

## CLAIMS

1. Instrument comprising a shaft with an actuating part at a distal end, a handle with an control device for operating the actuating part and at the proximal end, with the characteristic, that the handle is executed as an elongated grip (6) which is slightly convex curved on the side intended for location against the hand palm, and that the control device (5) is located on this side near the connection of the handle with the shaft (1).
2. Instrument according to claim 1, with the characteristic, that the handle (6) is positioned in essence perpendicular to shaft (1).
3. Instrument according to claim 1, with the characteristic, that the handle (6) is positioned in essence in line with the handle.
4. Instrument according to claim 1, 2 or 3, with the characteristic, that the handle can be rotated between the position in line with the shaft and the position at least perpendicular to the shaft.

5. Instrument according to claim 4, with the characteristic, that the handle can be blocked relative to the shaft.
6. Instrument according to one of claims 1-5, with the characteristic, that the control device has, at least partially, an in essence cylindrically shaped actuating surface, and is connected in such way with the instrument as to allow its rotation.
7. Instrument according to claim 6, with the characteristic, that the actuating surface has a profile which in tactile observation corresponds with a profile on the actuating part.
8. Instrument according to one of claims 1-7, with the characteristic, that the actuating part is executed as a grip jaw (7) and that the control device (5) that actively opens and closes the grip jaw is connected in such way with the grip jaw that for closing the grip jaw the control device is rotated in the direction of the handle, and for opening the grip jaw a rotation of the control device in the direction of the shaft is needed.
9. Instrument according to one of claims 1-8, with the characteristic, that the grip of the handle has a length in the range of 125-150 mm and a width at the central axis of the shaft of approximately 30 mm.
10. Instrument according to one of claims 1-9, with the characteristic, that the control device has a width of minimum 10 mm and maximum 20 mm.